

means for applying a curable, shear-thinnable, polymer composition onto [a] one surface of the tensioned web; and

means for shear thinning the polymer composition to substantially reduce its viscosity and selectively [placing] place it into the tensioned web to encapsulate at least some of the structural elements, leaving [at least some] most of the interstitial spaces open.

Please add the following claims:

133. Apparatus for controlling the placement of a polymer composition into a porous web, having a three dimensional structure of a plurality of structural elements with interstitial spaces therebetween and a three dimensional top surface opposed from a three dimensional bottom surface, comprising:

means for applying tension to the web;

means for applying a curable, shear-thinnable, polymer composition onto one surface of the tensioned web;

blade means for engaging said one surface of the tensioned web;

means for moving the web relative to said blade means; and

means for controlling said tension applying means and said blade means to shear thin the polymer composition to substantially reduce its viscosity and to selectively place it into the tensioned web to encapsulate at least some of the structural elements, leaving most of the interstitial spaces open.

134. ~~Apparatus~~ ^{3 System} as set forth in Claim 1 wherein said shear thinning means selectively places said polymer composition to encapsulate most of the structural elements of said web.

135. ~~Apparatus~~ ^{4 System} as set forth in Claim 1 wherein said polymer composition is selectively placed as an internal layer within said web positioned in a region extending through the web in a direction generally spaced from at least one major surface of said web; and

encapsulating at least some of the structural elements between said major surface and said region, leaving most of the interstitial spaces between said encapsulated structural elements open.

F ⁵ ~~System~~
136. ~~Apparatus~~ as set in forth in Claim 1 wherein said shear thinning means selectively places said polymer composition, leaving substantially all of the interstitial spaces open.

F ⁶ ~~System~~ ⁵
137. ~~Apparatus~~ as set in forth in Claim ~~136~~ wherein said shear thinning means selectively places said polymer composition to encapsulate most of the structural elements of said web.

F ⁷ ~~System~~ ⁵
138. ~~Apparatus~~ as set in forth in Claim ~~136~~ wherein said shear thinning means selectively places said polymer composition to encapsulate substantially all of the structural elements of said web.

014 F ⁸ ~~System~~
139. ~~Apparatus~~ as set forth in Claim 1 wherein:
said polymer composition is selectively placed to form a substantially continuous region extending through the web, said region of polymer composition filling the interstitial spaces and adhering adjacent structural elements;

said polymer composition is selectively placed to encapsulate at least some of the structural elements above and below said region; and

most of the interstitial spaces between said encapsulated structural elements above and below said region are open.

F ⁹ ~~System~~
140. ~~Apparatus~~ as set forth in Claim 1 wherein the means for shear thinning comprises at least one blade forced against said one surface of the tensioned web;

said blade having a leading edge, a trailing edge, and a bottom surface.

F ¹⁰ ~~System~~ ⁹
141. ~~Apparatus~~ as set forth in Claim ~~140~~ wherein said leading and trailing edges are defined by adjacent surfaces having a finish of at least root mean square 8.

F ¹¹ ~~System~~ ⁹
142. ~~Apparatus~~ as set forth in Claim ~~140~~ wherein the means for shear thinning comprises two or more blades spaced apart from one another.

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F 12 System 9
143. Apparatus as set forth in Claim 140 wherein each blade extracts at least some of the polymer composition from the surface of the web and from within the web and reintroduces it into the web.

F 13 System 2
144. Apparatus as set forth in Claim 143 wherein said blade means also extracts polymer composition from the surface of the web and from within the web and reintroduces it into the web.

F 14 System 11
145. Apparatus as set forth in Claim 142 including means for controlling the spacing between said blades.

94 F 15 System 9
146. Apparatus as set forth in Claim 140 including means for separating the structural elements of the web.

F 16 System 15
147. Apparatus as set forth in Claim 146 wherein the means for separating comprises at least one nip stand.

F 17 system 9
148. Apparatus as set forth in Claim 140 wherein the blade is positioned perpendicularly to said moving web.

F 18 System 9
149. Apparatus as set forth in Claim 140 including means for independently varying the angle of the blade relative to said web.

F 19 System 9
150. Apparatus as set forth in Claim 140 including means for controlling the force of said blade relative to said web.

F 20 System 9
151. Apparatus as set forth in Claim 140 including means for moving the web relative to said blade.

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F ²¹ ~~System~~ ²⁰
152. ~~Apparatus~~ as set forth in Claim 151 including means for varying the exit angle of the moving web relative to said blade.

F ²² ~~System~~ ²⁰
153. ~~Apparatus~~ as set forth in Claim 151 including means for varying the entrance angle of the moving web relative to said blade.

F ²³ ~~System~~ ²⁰
154. ~~Apparatus~~ as set forth in Claim 151 including means for varying both the entrance angle and the exit angle of said moving web relative to said blade.

F ²⁴ ~~System~~ ¹¹
155. ~~Apparatus~~ as set forth in Claim 142 including means for moving the web relative to said blades.

F ²⁵ ~~System~~ ²⁴
156. ~~Apparatus~~ as set forth in Claim 155 including means for varying the exit angle of the moving web relative to said blades.

F ²⁶ ~~System~~ ²⁴
157. ~~Apparatus~~ as set forth in Claim 155 including means for varying the entrance angle of the moving web relative to said blades.

F ²⁷ ~~System~~ ²⁴
158. ~~Apparatus~~ as set forth in Claim 155 including means for varying both the entrance angle and the exit angle of said moving web relative to said blades.

F ²⁸ ~~System~~ ²⁴
159. ~~Apparatus~~ as set forth in Claim 155 including means for independently controlling the force of each of said blades relative to said moving web.

F ²⁹ ~~System~~
160. ~~Apparatus~~ as set forth in Claim 1 including means for controlling the tension of the web.

F ³⁰ ~~System~~
161. ~~Apparatus~~ as set forth in Claim 1 wherein the shear thinning means also extracts polymer from the surface of the web and from within the web.

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F 162. ~~Apparatus~~ ^{System} as set forth in Claim 1 including means for curing the polymer composition within the porous web.

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F 163. ~~Apparatus~~ ^{System} as set forth in Claim 162 including means for controlling the temperature of the curing means.

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F 164. ~~Apparatus~~ ^{System} as set forth in Claim 162 wherein said curing means comprises a curing oven.

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F 165. ~~Apparatus~~ ^{System} as set forth in Claim 160 including means for controlling the temperature of said blade.

94 F 166. ~~Apparatus~~ ^{System} as set forth in Claim 162 including means for controlling the temperature of each of said blades.

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F 167. ~~Apparatus~~ ^{System} as set forth in Claim 161 wherein said moving means comprises a pair of counter-rotating nip rolls.

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F 168. ~~Apparatus~~ ^{System} as set forth in Claim 167 including means for controlling the pressure between said nip rolls.

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F 169. ~~Apparatus~~ ^{System} as set forth in Claim 167 wherein one of the nip rolls has a rubber surface of a predetermined hardness.

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F 170. ~~Apparatus~~ ^{System} as set forth in Claim 167 wherein one of the nip rolls has a rubber surface of a predetermined hardness and one of the nip rolls has a metal surface of a predetermined hardness.

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F 171. ~~Apparatus~~ ^{System} as set forth in Claim 167 wherein both nip rolls have a rubber surface of predetermined hardness.

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41 System 36
F 172. ~~Apparatus~~ as set forth in Claim 167 wherein both nip rolls have surfaces of different hardness or texture.

42 System 9
F 173. ~~Apparatus~~ as set forth in Claim 140 including means for damping the resonance of said blade.

43 System 11
F 174. ~~Apparatus~~ as set forth in Claim 142 including means for damping the resonance of said blades.

44 System 9
F 175. ~~Apparatus~~ as set forth in Claim 140 including means for vibrating said blade.

94 45 System 9
F 176. ~~Apparatus~~ as set forth in Claim 140 including means for vibrating said blade at a predetermined frequency.

46 System 11
F 177. ~~Apparatus~~ as set forth in Claim 142 including means for vibrating said blades.

47 System 11
F 178. ~~Apparatus~~ as set forth in Claim 142 including means for vibrating said blades individually at predetermined frequencies.

48 System 9
F 179. ~~Apparatus~~ as set forth in Claim 140 wherein said blade has a flat surface at the bottom thereof.

49 System 48
F 180. ~~Apparatus~~ as set forth in Claim 179 wherein the angle of entry of the web into said blade is greater than 0 degrees and less than 90 degrees, the web generally follows the bottom surface of said blade and the angle of exit of the web from said blade is greater than 0 degrees and less than 90 degrees.

50 System
F 181. ~~Apparatus~~ as set forth in Claim 1 including:
means for applying the polymer composition to the other surface of said web; and

means for shear thinning the polymer composition on said other surface to substantially reduce its viscosity and selectively place it into the tensioned web to encapsulate at least some of the structural elements, leaving most of the interstitial spaces open.

F ⁵¹ ~~System~~ ³¹
182. ~~Apparatus~~ as set forth in Claim ~~162~~ including means for controlling the release of tension of said web to cause the structural members to separate prior to cure.

F ⁵² ~~System~~ ³¹
183. ~~Apparatus~~ as set forth in Claim ~~162~~ wherein said web is under substantially no tension during curing.

94 F ⁵³ ~~System~~ ³¹
184. ~~Apparatus~~ as set forth in Claim ~~162~~ including means for holding said web under transverse tension during curing.

F ⁵⁴ ~~System~~
185. ~~Apparatus~~ as set forth in Claim 1 including means for distorting the web during shear thinning to facilitate entrance of the polymer composition within the web.

F ⁵⁵ ~~System~~ ⁵⁴
186. ~~Apparatus~~ as set forth in Claim ~~185~~ wherein said means for distorting comprises means for stretching said web transversely.

F ⁵⁶ ~~System~~ ²
187. ~~Apparatus~~ according to Claim ~~133~~ wherein said blade means comprises one or more additional blades for working the polymer composition into the web, extracting polymer composition from the surface of the web and from within the web, and reintroducing the polymer into the web.

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188. Apparatus for controlled placement of a ^{shear thinnable} polymer composition into a porous web, having a three dimensional structure of a plurality of structural elements with interstitial spaces therebetween, comprising:

means for advancing a porous web;

means for applying tension to the porous web;

means for applying a curable, shear-thinnable, polymer composition to the web; and

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means for shear thinning the polymer composition to reduce its viscosity and place it to encapsulate at least some of the structural elements, leaving most of the interstitial spaces open;
means for controlling the tension of the porous web during shear thinning of said polymer composition into said web; and
means for curing the polymer composition within the porous web.

F ⁵⁸ ~~189~~ ^{System} ~~Apparatus~~ as set forth in Claim ⁵⁷ ~~188~~ including means for extracting the polymer composition from the surface of the web and from within the web.

F ⁵⁹ ~~190~~ ^{System} ~~Apparatus~~ as set forth in Claim ⁵⁷ ~~188~~ wherein tension on the web is substantially released immediately prior to and during curing.

F ⁶⁰ ~~191~~ ^{System} ~~Apparatus~~ as set forth in Claim ² ~~135~~ wherein tension on the web is substantially released immediately prior to and during curing.

F ⁶¹ ~~192~~ ^{System} ~~Apparatus~~ as set forth in Claim ² ~~135~~ wherein said means for controlling places said polymer to form a substantially continuous region extending through the web.

F ⁶² ~~193~~ ^{System} ~~Apparatus~~ as set forth in Claim ⁴ ~~135~~ wherein said polymer composition includes an additive and at least some of said additive is placed on the surface of the encapsulated structural elements and at least some of said additive is placed on one or both surfaces of the internal layer.

F ⁶³ ~~194~~ ^{System} ~~Apparatus~~ as set forth in Claim ⁸ ~~135~~ wherein said polymer composition includes an additive and at least some of said additive is placed on the surface of the encapsulated structural elements and at least some of said additive is placed on one or both surfaces of the polymer region.

F ⁶⁴ ~~195~~ ^{System} ~~Apparatus~~ as set forth in Claim 1 wherein said polymer composition includes an additive and at least some of said additive is selectively placed on one or both surfaces of said web.